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ORIGINAL ARTICLE

Dietary Counseling in the Prevention and Control Of Oral Diseases – A Review

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SUMMARY

There is a close relationship between diet, nutrition and dental health. Oral tissues like all tissues in the body are diet and nutrition-dependent. Knowledge of food sources, their properties, functions, requirements, optimal levels and consequences of deficiencies must form the basis for dietary counseling

Enough is now known about the interdependence of nutrition, diet and dental diseases that dietary counseling has become a very important and integral part of dental care in developed countries. This is not surprising because oral tissues like all tissues in the body are diet and nutrition – dependent.

In this paper, the scientific basis for dietary counseling in oral health and the role of sucrose in the etiology of some oral and metabolic disease has been reviewed. The importance of diet counseling and the critical elements of counseling have been outlined.

It is recommended, that dietary counseling in dental diseases should be comprehensive for the whole human health and not just for any particular dental disease. Given the time consuming nature of diet counseling it is suggested, that dental practitioners make effort to regularly refer patients/clients presenting with diet-related oral diseases to nutritionist-dietitians who have been professionally trained in the science and art of diet/nutrition counseling. In the absence of such professionals, patients/clients should as a matter of routine be referred to dental nurses and dental hygienists for nutritional counseling.

Key Words: Diet, Nutrition, Oral diseases, Counseling.

INTRODUCTION

It is accepted in that in dental health, like other aspects of medical health, any programme without a preventive component can never achieve much on the long term. In this respect, preventive aspects of dental heath education have centered on the characteristics of some food constituents or the nutrients they contain.

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These include:

Detersive foods

- Hard or detersive foods have valuable cleansing action and remove plague and food debris from the teeth and surrounding tissues.

Surface acting agents

- Water fluoridation tends to reduce both the surface energy of enamel[1] and its tendency to absorb proteins.

Systemic action of nutrients

General nutrition

- Mellanby[2] showed that inadequate nutrition during childhood interferes with tooth development. The consequence, is that it leads to gross or microscopic defects in enamel, either hyperplasia or hypomineralisation. Surface faults may facilitate attachment and retention of bacteria-containing dental plague and contribute to the subsequent destruction of caries-prone tooth. In effect, nutritional influences are greatest during tooth development.
- Specific nutrients

Specific nutrients such as Fluoride, trace elements like strontium, molybdenum, lithium, boron, selenium and vitamins have direct affect on subsequent susceptibility to caries. Severe protein deficiency also causes delay in tooth eruption.

In animals, the chemical composition of the teeth can be modified by manipulating the protein, mineral (calcium, and phosphorus), vitamins (A, C&D) and trace elements (fluoride, vanadium, molybdenum, selenium and boron) content of diets during tooth formation.[3, 4]. It has not been fully proved whether it is the same in man.

Fluoride is the only dietary element effective in producing decay-resistant teeth. The dental caries incidence in both deciduous and permanent teeth is reduced by approximately 60% in children who drink water containing 1-ppm fluoride throughout the period of tooth development. Fluoride supplementation in areas where the drinking water is not fluoridated should be started at 6 months of age at a daily dose of 0.25mg of fluoride and continued at this level until 18 months of age. Older pre-school and school-age children should receive fluoride supplementation in amounts ranging from 0.25mg-1.0mg per day, depending on age level of natural fluoride in the drinking water[5].

Nutrient inter-relationship

There are over 40 essential nutrients that act in an inter-related fashion to sustain life. Each nutrient is linked to all others and death is inevitable without any of them. Each step in the chain reactions which occur in the body through which a nutrient goes in a metabolic pathway is mediated by at least one enzyme system. The functioning of every enzyme system is dependent upon a combined action of an apo-enzyme, which is composed primarily of amino-acids and a coenzyme which includes, a vitamin and/or a mineral element.[6]

- The biological activity of carbohydrates, proteins, fats vitamins and minerals is so interdependent that an imbalance of any one will likely affect most of the others. Because of this, consuming a variety of food is essential in order to provide a variety of essential nutrients. Several researchers have demonstrated that vitamin C could prevent or correct iron deficiency anaemia by enhancing the absorption of iron that is present in foods.[7, 8, 9]

Rules for daily food selection:

- The slogan "the more natural the food, the better" is a truism. Processed foods and highly refined foods are short in

vitamins, minerals, vegetable oils, proteins and fibres but high in sugar. These foods are often well advertised. In order words, the depleted foods are more profitable to the manufacturers.

- Despite advertisers' gimmick, it is best to avoid refined or processed foods containing food additives. This is because, the nutritional value of any food is inversely related to the shelf life, i.e. the higher the nutritional value of food, especially in vitamins, minerals and essential amino acids, the shorter the shelf-life.

- "Nourishing foods get bad and depleted foods do not go bad for months". It is better therefore, to reduce the consumption of sugar by buying foods in the natural state and preparing them at home.

- "Diets rich in fermentable carbohydrates favour caries formation".

Post-eruptively, the most significant dietary influence on the pathogenesis of caries is the frequent ingestion of carbohydrates capable of diffusing into the dental plague and serving as substrate for acid-producing micro-organisms.[10]

It is especially noteworthy that all experimental diets that produce caries in animals are rich in fermentable sugars. In man, direct ph measurements have shown that acids accumulate in plagues following ingestion of a food containing a microbiologically degradable sugar. Acid production in plague is intermittent rather than continuous, with each episode lasting 30-45 minutes following ingestion of sugar-containing meals and snacks[11.] The sequence of acid production is governed by the frequency, quantity and plague penetrability of the carcinogenic foodstuff.

The carcinogenicity of fermentable carbohydrate varies with physical form, chemical composition, route of administration and presence of other food constituents. Carbohydrates that are rapidly cleared from the month by saliva and the oral musculature are less conducive to caries than those that are slowly removed. Polysaccharides are less readily fermented by plague bacteria than are monosaccharide. Plague organisms produce less acid from such sugar alcohols as sorbitol and mannitol than from corresponding sugars. Glucose or sucrose fed entirely by stomach tube or intravenously does not contribute to decay because they are not secreted in saliva for microbial breakdown in the mouth.

Meals high in fat, protein or salt reduce oral retentiveness of carbohydrates. Refined pure carbohydrates are more caries promoting than crude carbohydrates that are complexed with other food elements some of which are capable of reducing enamel solubility and possess antibacterial properties.

Structures with a fast cellular turnover-rate are particularly susceptible to nutritional deprivation. Degeneration of nutritionally depleted tissues is hastened and intensified by superimposed trauma. Rapid cell growth and replacement, together with repeated exposure to physical, chemical, bacterial and thermal insults are characteristic of the oral mucosa. Each of these features contributes to the notoriously high vulnerability and increased frequency of involvement of the mouth structure during nutritional deprivation [12].

Oral signs and symptoms often constitute the presenting complaint in patients with nutritional disorders. The symptoms may antecedent, coincide with or follow the emergence of deficiency-induced signs. These may be burning, soreness, tenderness, dryness, diarrhoea and a loss or diminution in taste acuity. Iron deficiency anaemia will give soreness of tongue, as would vitamin B_{12} deficiency [12].

Stomatodynia is a prominent and early symptom of pellagra (niacin and tryptophan deficiency), sprue (folic acid deficiency), kwashiorkor (protein-energy deficiency) and nutritional macrocytic anaemia. Xerostomia occurs in association with vitamin A deficiency, ariboflavinosis, pellagra, iron deficiency and sprue. Sialorrhea often accompanies acute nutritional stomatities and is especially copious in pellagra. Impairment of taste sense is common in pellagra and beriberi (thiamin deficiency) [12].

Stomatologic signs notably cheilosis and gingivitis typifies many of the nutritional deficiency states. Lip lesions at the corners of the mouth are found in deficiencies of riboflavin, niacin, protein, vitamin B_{12}, folic acid, iron, pyridoxine and vitamin C. These lesions are indistinguishable as to cause and follow a similar pattern originating as a pallor at the commissure, followed after several days by erythema, maceration, slough and radiating superficial fissuring.

Deficiencies of niacin, tryptophan and vitamin C may each produce a gingival pathosis. A protracted lack of niacin or tryptophan results in an impairment of gingival surface continuity with necrotic areas developing at the tips of the interdental papillae. These become heavily infected with Vincent's organisms, producing a typical acute and chronic ulcerative-necrotising gingivitis (ANUG). Scorbutic gingivitis is limited to those areas where teeth have erupted or are about to erupt. The gingival appears swollen, engorged, discoloured, and friable and bleeds readily in response to slight pressure.[12]

A nutritionally depleted oral mucosa is not normal in terms of size, colour topography, sensation and surface continuity. Such mucosa can quickly be restored by administration of the appropriate nutrient. Therapeutic amounts of the specific nutrients must be used as a supplement to the daily diet, since even the best planned diets contain only small amounts of food factors needed to correct a deficiency in which there has been a tissue damage.

Although direct correlation between diet/nutrition and chronic destructive periodontal disease has not been fully and clearly established, there is general agreement that malnutrition may predispose or modify the course of this multifactorial disease. The periodontal structures are particularly sensitive to the effects of prolonged malnutrition on tissue replacement. Soft foods requiring little chewing provide minimal stimulation. Soft sticky foods that cling to the necks of teeth contribute to gingival irritation. Coarse fibrous foods that need vigorous chewing detersive foods are more cleansing and stimulating to the periodontal tissues. The selection of nutritious, detergent foods must be started early in life and carried over into adulthood, when periodontal disease becomes a major oral health problem. Nutrition/diet counseling goes a long way in preventing periodontal diseases.

Diet and nutrition counseling:

Burnard[13] defines counseling as the means by which one person helps another to clarify his/her life situation and to decide on further lines of action. Counseling in the health care setting means a dialogue between a client/patient and a health care provider with the basic aim of solving a problem and providing a change in behaviour. Diet counseling involves constant interaction between the counselor and the clients/patients about therapeutic diets to produce a change in food behaviour. It is also targeted at healthy people who could also benefit from changes in food intake and habit for preventive heath to reduce the risk of developing chronic diseases.[14]

The main objects of diet and nutrition counseling are to screen for and correct food-related oral disturbances and to promote good dietary habits that prevent disease. A broader view of malnutrition should also be at the back of the counselor's mind (see table 1). There must be mutual trust for counseling to succeed. Therefore, a rapport must be built, ab initio, between the patient and the counselor. This will engender acceptance, understanding and sincerity. The language must be clear, simple and understandable for the patient to co-operate. The culture, educational background, psychology, social status of the patient must inform the counselor to determine the pattern of food acceptance and eating habits. The counselor must be endowed with the professional stature, competence and interview skills needed to transmit to the patient, in appropriate language, the scientific rationale for a dietary programme that may necessitate seemingly drastic changes in life-style.

Witteman[15] has identified the critical elements of dietary counseling as involvement between two willing participants who meet to consider a problem, question, or situation posed by either the dentist or the patient. It is a face-to-face undertaking that takes place in privacy and in a friendly and tension-free atmosphere. Counseling is essentially a matter of creating the right atmosphere where the client will freely talk and develop understanding of the problem in personal terms, under the guidance of a counselor. Counseling aims at an individualized modification of entrenched behaviour pattern by the strongly motivated patient.

Nutritional and dietary counseling require time, patience and perseverance. Many visits may be needed to produce results. The first visit should be devoted to establishing rapport, arousing interest, making the association between diet and dental health and establishing the need for a relevant dietary history (see table 2). Questions should be encouraged and discussed fully at the second visit when the diet census is analysed and at subsequent visits that serve to monitor performance and fortify the association between dental health and good food habits.

It can be seen from the above that in the busy clinic enough attention is usually not devoted to counseling. The counselor need not necessarily be the dentist. Anybody (nutritionist-dietitian, dental nurse, dental hygienist) who has the required education and training, plus a personality that puts a patient at ease and creates a climate for patient impression can do the counseling. The diet counselor should also have empathic understanding of the client's/patient's difficulties and be sensitive to individual patients/clients.

In conclusion, since enough scientifically-sound diet and nutritional information is available to prevent oral and dental diseases, it is the duty of nutritionist-dietitians and oral health

workers to make this information available to patients so as to make nutritional guidance that is precise, persistent and result-oriented In every health facility where the services of dietitian are available, all patients them help themselves through an individually tailored dietary and presenting at the dental clinic/hospital that require dietary counseling should be promptly referred to the nutritionist-dietitian.

Table 1: Sucrose Induced Defects in Metabolism [6]

Metabolic defects induced by dietary sucrose	*Disorders influenced by metabolic defects*
Increase in dental plaque	Caries, periodontal disease
Increase in candida albicans	Oral and vaginal moniliasis
Decrease in phagocytosis	All infectious disorders
Increase in blood uric acid	Gout, diabetes, cardiovascular diseases
Increase in blood cholesterol	Cardiovascular diseases
Increase in bile cholesterol	Gallstones
Increase in blood triglycerides	Cardiovascular diseases, gout, diabetes
Increase in platelet stickiness	Cardiovascular diseases
Increase in blood sugar	Diabetes, cardiovascular diseases, periodontal disease, gout, others
Increase in blood insulin	Reactive hypoglycemia, diabetes, periodontal disease
Increase in body fat synthesis and storage	Obesity, diabetes, cardiovascular diseases, gout, etc
Limitation in ability of bombesin and cholecystokinin to induce satiety and Inhibit eating	Obesity, bulimia, anorexia Nervosa
Increase in intestinal transit	Disorders of colon and rectum, varicose veins, hemorrhoid, cancer of colon and rectum, constipation
Increase in urinary calcium excretion	Urinary lithiasis, osteoporosis, (including alveolar bone loss)
Increase in urine ph	Urinary lithiasis, genitourinary Infections
Increase in gastric acidity	Indigestion, peptic ulcer, all diseases
Increase blood pressure	Hypertension, cardiovascular diseases
Increase in tissue lactic acid during circulatory arrest	Brain and CNS damage

DIET HISTORY

1. Have you recently lost or gained more than 5kg?_____If yes, explain the surrounding circumstances (including associated illness, dietary changes, and time frame):
2. Do you eat at regular times each day?_____ How many times per day?_____
3. Do you usually eat snacks?_____ When?_____ _____Where?_____ _____
4. What foods do you particularly like?_____ _____
5. Are there foods you don't eat for other reasons?_____ _____
6. Do you have difficulty with eating?_____ _____
7. How would you describe your feelings about food?_____ _____
8. How does your eating habit change when you are emotionally upset?_____
9. Are you or any member of your family on a therapeutic (special) diet?_____ If yes, who and what kind?_____ _____ _____
10. Do you drink alcohol? How much?_____ How often? _____
11. How would you describe your exercise habits?_____ _____Type of exercise?____ _____Intensity_____ duration_____Frequency _____
12. Are there any other facts about your lifestyle that you think might be related to your nutritional health? Explain_____

FOOD INTAKE FOR A 24-HOUR RECALL

Dietitian/counselor, please record the amounts and types of food and beverages consumed by client / patient within the past 24 hours.

TIME OF DAY	FOOD ITEM	AMOUNT (Specify Amount) (Use visuals)	DESCRIPTION (HOW COOKED, HOW SERVED)

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FOOD FREQUENCY CHECKLIST; STARCHY/TUBERS/FRUITS & CEREALS

1. How often do you eat the under listed food items?.*

(Add on other familiar food items)

S/N	FOOD ITEM	NO. OF SERVINGS (Use visuals)	FREQUENCY PER DAY/WEEK/ MONTH	S/N	FOOD ITEM	NO. OF SERVINGS (Use visuals)	FREQUENCY PER DAY/WEEK/ MONTH
1.	Rice			11.	Garri		
2.	Pasta (Noodles, Macaroni, Spaghetti			12.	Akamu/Custard/Quaker oats		
3.	Pancake			13.	Corn (Fresh/dried)		
4.	Crackers			14.	Abacha		
5.	Semovita (Farina)			15.	Yam		
6.	Sweet rolls or doughnuts			16.	Plantain (Fried/roasted boiled)		
7.	Pastries (buns, biscuit, cakes, cookies)			17.	Pounded yam		
8.	Potatoes (Irish/Sweet)			18.	Cocoyam		
9.	Potato chips						
10	Cassava Chips (Abacha)						
		MEAT AND LEGUMES, NUTS AND SEEDS					
1.	Beef			14.	Ukpa		
2.	Poultry (Chicken, turkey, Guinea fowls			15.	Ajama/Ijiriji		
3.	Fish			16.	Agbara oti		
4.	Organ meat (Liver, Kidney)			17.	Milk		
5.	Pork			18.	Soyamilk		
6.	Snail			19.	Yoghurt / Ice-cream		
7.	Egg			20.	Cheese		
8.	Beans/Akidi/ Fiofio						
9.	Ukwa						
10.	Moi Moi						
11.	Okpa						
12.	Ugba						
13.	Akara						

FOOD FREQUENCY CHECKLIST CONTD. FRUITS & FRUIT JUICES

S/N	FOOD ITEM	NO. OF SERVINGS (Use visuals)	FREQUENCY PER DAY/WEEK/ MONTH	S/N	FOOD ITEM	NO. OF SERVINGS (Use visuals)	FREQUENCY PER DAY/WEEK/ MONTH
1.	Orange			9.	Sour sop		
2.	Paw paw			10.	Grape		
3.	Pineapple			11.	Lemon		
4.	Cashew fruit			12.	Ugili		
5.	Udala			13.	English apple		
6.	Guava			14.	Banana		
7.	Avocado pear			15.	Mango		
8.	Ube (Local pear)						
		VEGETABLES (All leaf/fruits & Immature seeds)					
1.	Ugu			11.	Garden egg		
2.	Green			12.	Waterleaf		
3.	Ora			13.	Lettuce		
4.	Bitter leaf			14.	Arira		
5.	Cabbage			15.	Kerenkere		
6.	Cucumber			16.	Achara		
7.	Pumpkin			17.	Okro		
8.	Akidi			18.	Anara leaf		
9.	Fresh corn						
10.	Carrot						
		FATS & OILS					
1.	Butter / Margarine			2.	Salad dressing or Mayonnaise		
3.	Oil (Palm, Vegetable)						
		BEVERAGES					
1.	Coffee or Tea			5.	Beer		
2.	Cocoa drinks (Bournvita, Milo, Ovaltine etc)			6.	Whisky		
3.	Red Wine			7.	Kunu/Zobo/ Burukutu		
4.	Stout			8.	Malt drinks		

		MISCELLANEOUS (including herbs spices of condiments)		

1.	Chocolate /Sweets Peppermint			6.	Garlic, ginger, thyme		
2.	Sugar, Jam, Marmalade, honey						
3.	Soft drinks						
4.	Fruit drinks						
5.	Fast foods eaten						

The dietitian/counselor helps the client estimate portion sizes and frequency of use.

REFERENCES

1. Glantz PO. Wettability and adhesiveness. A study of enamel dentine, some restorative materials and dental plaque. Odontol. Rev 1969; (20): Supplement 17.
2. Mellanby M. Diet and the Teeth. Part III. The effect of Diet on Dental Structure and Disease in Man. London: HMSO, 1934.
3. Dreizen S. Vitamins and dental caries. In: Gould RF. (eds) Dietary Chemicals Vs Dental caries. Advances in Chemistry series of Washington DC, American Chemical Society. Pp 33-45. Washington DC, 1976.
4. Schourl M M. The effects of dietary deficiencies upon the oral structures. Physiol Rev 1945; 20: 442 – 482.
5. Foman S J, Wei S M V. Prevention of dental caries. In: Foman Screening and follow-up. Rodevilla DMEW Publication No. Pp 76 – 5612. USA: 1976.
6. Ringsdorf W M. Cheraskim E. Optimal Nutrition: A new prescription: Paedodont 1984; 8 (2), Pp 123-137.
7. Sayer M H, Lynch S R, Chariton R W, Sothwell T M. Iron absorption from rice meals cooked with fortified salt containing ferrous sulphate and ascorbic acid, Sr J Nutri 1994; 31(3), Pp 367-375.
8. Baynes R D, Bothwell T H. Iron deficiency. Annual Review of Nutrition. 1990; 10:133-148.
9. Monsen E R. Iron nutrition and absorption, dietary factors which impact iron bioavailability. J A D A. 1988; 88: 786 – 790.
10. Cawson R A. (ed) Etiology of Dental Caries In: Essentials of Dental Surgery and Pathology. Pp 14-35. J & R Churchil, 1968.
11. Whiteney E N, Rolfes S R. (eds) Health Effects and Recommended Intakes of sugars In: Understanding Nutrition. Pp 131 – 136 7th ed. West Publishing Company, 1996.

12. Draizen S, Stone R E. Nutritional Deficiency stomatitis In: Practical Dental Mongraphs. Pp 5 – 32 Chicago: Year Book Medical Publishers Inc, 1961.
13. Burnard P. Counseling skills for Health Professionals. 1st ed. p 22. London: Chapman and Hall, 1992.
14. Robinson et al. Basic Nutrition and Diet Therapy. Pp 20 – 21. New Jersey: Von Hoftman, 1997.
15. Witteman J K. Behavioural implications in successful dietary counseling. In: Aifano N G, Depaola D P. (eds). Symposium on Nutrition. Pp 601 - 611 Dental clinics of North America Philadephia: WS Saunders Co, 1980.